

to the particular set of natural conditions under which it grows are facts which are seldom absent from his mind, and as a consequence there is a freshness and reality about much which he has written that are often absent from the writings of the laboratory and museum worker.

Dr. Fowler's accounts of the Hydromedusæ and Scyphomedusæ are, in our opinion, the least satisfactory portions of the volume. The style is too concentrated and concise to make the writing effective, and intellectual interest has been entirely sacrificed in an attempt to introduce every available fact and to deposit it in a properly labelled compartment. The result resembles the syllabus of an advanced course of lectures on the groups dealt with rather than an intelligible account of those groups.

In the chapters on Anthozoa and Ctenophora, Mr. Bourne presents us with an excellent series of detailed descriptions of particular types, together with a clearly stated and well-marshalled body of facts concerning the groups as a whole. His work will undoubtedly prove of great value to both teachers and students. We, however, fail to find in these two sections that originality of treatment and originality of thought which characterise Prof. Minchin's section on the Porifera.

The whole work is well illustrated, being in this respect a great improvement on the volume of the treatise previously published (Part III. Echinoderma). The figures for which Prof. Minchin and Mr. Bourne are responsible, many of which are original, are specially worthy of praise.

THE GRAPHICAL MENSURATION OF VAULTS.

Il Calcolo Grafico applicato alla Misura delle Volte.

Prof. Ernesto Breglia. 5th serie, vol. i. (Atti del Reale Istituto d'Incoraggiamento di Napoli, 1899.)

GRAPHICAL methods are used to a certain extent in the solution of engineering problems, although perhaps their employment is not so extended as their neatness and simplicity merit. In some cases, it is true, where the simplification is great and the application easy, they are used practically to the exclusion of other methods. But in other cases where a graphical treatment would effect almost as great a simplification the methods have never been very generally applied. The reason lies, we think, in the fact that it requires greater ingenuity to treat a problem graphically than analytically. Problems such as occur in practice, even though they may be complicated, can generally be hammered out by analytical means. A good mathematician, no doubt, will be able to find a short cut to the solution, but the engineer, whose ready stock of mathematical knowledge on which he can draw with ease amounts to little more than the algebra he learnt at school and an acquaintance with the principles of the calculus, will be able to work out the solution by dint of determined plodding. With graphical methods it is different. To begin with, the geometrical training which an English engineer receives at school is a hindrance rather than a help, so that when he comes to study graphical systems he finds himself in a region unknown to him and is obliged to disembarass himself of the Euclidean notions acquired in his youth. We are afraid that the Englishman will never be quite happy

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in using geometrical methods until the groundwork of his knowledge is laid with some more suitable text-book than Euclid's Elements. In addition to this, with these methods each new problem requires somewhat different treatment; it is hard, and often impossible, to lay down very definitely the lines on which to proceed. The ingenuity which is consequently required can only be obtained, by any except the born mathematician, by the habitual use of the system.

Prof. E. Breglia's paper illustrates what we have been saying. The method that he has worked out for measuring the volumes of arches and vaults is extremely neat. In the simpler cases it is, as is natural, very much easier to follow and apply, and the ease of doing so is such that it should commend itself to all who have need to make such measurements. In the cases of vaults of more complicated shape the method becomes also more complex; artifices have to be used in order to "dodge" the more important difficulties. It is just these artifices that are so difficult to find when a new problem is attacked. To apply Prof. Breglia's method to the determination of the volume of a vault similar in shape to one of those he has examined in the paper before us would be fairly simple, even though the shape might be very complicated; to apply it to the case of a vault of quite a different shape would not be nearly so easy. Prof. Breglia has, however, examined a great variety of cases in a thorough manner, and has thus rendered his paper very valuable.

Prof. Breglia's system has other advantages besides a simplicity which enables the volume of a vault of complicated shape to be found without the use of advanced mathematics. The accuracy can be increased practically at will by varying the number of sections into which the vault is divided; with analytical methods high accuracy is often only attainable by undue complication of the mathematics. We are inclined to think, also, with Prof. Breglia that error is less likely to occur in its use, as should any mistake be made it will show itself directly; but this is an advantage that must not be given too great weight, as graphical methods possess possibilities of error, especially in the interpretation of the results, which are not to be met with in other methods. The system is, however, a very useful one, and the paper is worthy the careful attention of all those interested in the subject.

OUR BOOK SHELF.

Experimental Chemistry. By Lyman C. Newell, Ph.D. Pp. xv + 410. (Boston: Heath and Co., 1900.) Price 5s.

DR. NEWELL has added one more to the already formidable array of elementary science text-books, each of which, according to their respective authors, has been written to supply a long-felt need. In the present instance, the object is to promote the more efficient teaching of chemistry by modern methods; and in writing his book Dr. Newell has been actuated by "a desire to provide a course of study which shall be a judicious combination of the inductive and deductive methods."

We fail to see in what way Dr. Newell's book superior to a hundred others of a similar kind. The ideal that the author has set before him is a very high one, and we should be the last to deprecate any attempts to improve upon modern methods of teaching experimental science. It is obvious that the time at the disposal of the average student is so limited that it would be

quite impossible to carry out the logical method consistently, and at the same time cover any but the most elementary parts of the subject; the only question is as to the nature of the compromise.

Dr. Newell has attempted to cover a very wide field, with the result that a large amount of matter has been inserted which is beyond the range of an elementary student and of little use to the more advanced. His method is one that is excellent in theory, but in practice easy to carry to excess. To the title of a treatise on elementary chemistry the book lays no claim; it is nothing more than a guide-book for use in the laboratory, and must be supplemented by others for detailed information; while as a work of educational value it is by no means the most efficient that could be devised. Elementary students, however, will doubtless find portions of it of considerable assistance, for the experiments are carefully described, and the illustrations clear.

The Elements of Darwinism, a Primer. By A. J. Ogilvy. Pp. 160. (London: Jarrold and Sons, 1901.) Price 2s. 6d.

THE object of this little book is, as the author states in the preface, to give the ordinary non-expert reader an intelligent notion of the theory of natural selection. There is no doubt that there is scope for such a work, for even at the present time it is remarkable how widespread are the ignorance and misapprehension of Darwin's teaching among the general public. Mr. Ogilvy divides the subject into three parts: general statement, consisting of eleven chapters; illustrations, consisting of seven chapters; and a third part consisting of nine chapters. Although keeping fairly well within the limits of Darwin's teaching, the author shows some originality of treatment, and has not slavishly followed the custom so prevalent at one time of simply rearranging the facts collected by our great master and dishing them up as an original contribution to science. Several new illustrations of Darwinian principles are introduced, some of them appropriate and forcible, others less appropriate and in some cases altogether questionable. In the chapter on flight, for example, the author attempts to define two kinds: "Now some birds fly chiefly by muscular, some by nervous power." The condor and the albatross are quoted as examples of the former, and the partridge as an example of the latter. The principles which have governed the author in classifying the contents of the various chapters are not in all cases clear, and a rearrangement might have been made in some instances with advantage. One other very obvious defect is the too facile exposition of evolutionary steps which are at present difficult to understand, and of which the course is confessedly obscure. The kind of reader for whom Mr. Ogilvy has written his book is just the person upon whom such treatment would produce an impression of dogmatic security. In spite of these defects, however, any one previously ignorant of the subject who carefully reads the volume cannot fail to acquire a fairly sound idea of Darwinism, and this is all that the author claims to have had in view. It should be added that the manuscript has been read by Dr. Alfred Russel Wallace, who does not, however, hold himself responsible for all the statements. R. M.

La Betterave à Sucre. Par L. Malpeaux. Pp. 206. (Paris: Masson and Gauthier-Villars. No date.) Price fr. 2.50.

THIS small volume, one of the series known as "l'Encyclopédie scientifique des Aide-Mémoire," is prefaced by a few general considerations upon the importance of the sugar beet. In the opening chapter the history and the present state of cultivation, as well as the future of the

sugar beet, are dealt with. As regards the future it is interesting to note that as the supply already meets or even exceeds the demand, the only hope held out to the cultivator is an increase in the consumption of sugar. The second chapter treats shortly of the production of sugar in the plant. A brief description of the different varieties of beet is followed by a chapter on the production of seed. This is perhaps the most interesting portion of the volume before us. In it the methods of selection, physical, chemical and genealogical, the culture of seed plants and the analysis of the roots are given at some length. Then follow chapters on the influence of climate and soil and manures. The important fact that the beet removes from the soil very little else than carbon, hydrogen and oxygen, and therefore the manures supplied to it benefit the crops which follow, is duly insisted on. Two short chapters on sowing, hoeing and thinning are followed by one on diseases, insect and other pests. Although a number of remedies, such as sprinkling with copper arsenite, &c., are mentioned, proper cultivation is upheld as the most important factor in preventing and overcoming such diseases and insect ravages. The remaining pages are devoted to the harvesting and storage, the marketing, and, in connection therewith, the analysis of the juice and the cost of cultivation.

The illustrations are clearly drawn and the curves showing annual production of roots, &c., are a valuable feature of the book. A bibliography of the subject, in which French authors only are mentioned, is attached. The addition of an index would add to the value of this useful monograph. J. E. M.

Assimilation chlorophyllienne et la Structure des Plantes. By Dr. Ed. Griffon. Pp. 106. (Paris: Georges Carré et C. Naud.) Price 2 francs.

L'Evolution du Pigment. By Dr. G. Bohn. Pp. 96. (Same publishers.) Price 2 francs.

THESE two manuals belong to the biological section of the valuable "Scientia" series, each volume of which contains authoritative descriptions of subjects in which progress is being made.

Dr. Griffon's brochure deals with a subject which has engaged the attention of many physiological botanists. Numerous determinations have been made of the physico-chemical properties of chlorophyll; and the experimental methods employed to measure the changes resulting from the action of its functions have been so much improved in recent years that valuable results are frequently obtained. But there is a matter which has almost been left in the background, namely, the influence of the structure of plants on the decomposition of carbon dioxide. It is true that important data have been obtained upon this subject, but they are chiefly from special points of view, and no general conclusions have been reached. Dr. Griffon reviews the work which has been done upon this subject, both as regards plants which naturally differ among themselves in anatomical characters and plants of the same species of which the structural differences are due to varying conditions as regards light, heat, hygrometric state, presence of various mineral salts, &c. A chapter upon the nature and measurement of assimilation in plants precedes this treatment, and one on the principal factors determining the rate at which carbon dioxide is decomposed concludes the book. Dr. Griffon succeeds in presenting a connected account of researches and results of interest to all students of botany.

Dr. Bohn's book opens with a general statement of cell structure, bacteria and pigmentary bodies. He then deals in succession with the constitution and biology of pigments, modifications of pigment in organisms, evolution of pigment in various groups of animals, and utilisation of colour in nature for protective and other purposes.